

Remarks

The Applicants have amended the Specification to correct a number of minor typographical and grammatical errors to the Specification and Claims, to address a number of issues as to form as helpfully suggested by the Examiner and to clarify the differences of the invention over the prior art. Detailed explanations are set forth below.

Page 38 of the Specification at line 17 has been amended to correct a minor typographical error. Specifically, “200” has been changed to “2000”. This can be seen as being an obvious typographical error by taking the new number in the context of line 16 setting forth a large range of outlet holes of 1 to 6000. Then, in the subsequent text following in lines 17 - 23, the number of outlet holes on the lower end is discussed. Then, the discussion moves to the number of holes which are preferred in one sense, wherein line 21 states that, if the number of holes exceeds 2000, it is difficult to secure the accuracy of the outlet holes. Thus, it inherently follows that a desirable range would have an upper range of 2000 instead of 200. Also, a number of the dependent claims as originally filed, such as Claims 5 and 6, refer to the 2000 outlet hole number. We accordingly respectfully request entry of this correction of a typographical error into the Official File.

We have also amended the Specification at page 74, which removes the subject matter previously introduced into the first full paragraph. The Applicants accordingly respectfully request withdrawal of the objection to the Specification on that basis.

Turning now to the Claims and the Examiner’s specific helpful comments spanning pages 4 and 5 of the Official Action, amendments to the Claims have been made and will be addressed in that order.

Claims 1, 2 and 33 have been amended to remove the limitations of “a pitch of 360 μm or less” and “arranged in line having a length of 288 mm”. Withdrawal of the rejection of Claims 1, 2 and 33 is accordingly respectfully requested.

Claim 7 has been amended in accordance with the Examiner's helpful suggestion to move "outlet holes" before "wherein". Claim 12 has also been amended to remove the objectionable "wherein" clauses.

Claim 13 has been amended to recite that one paste applicator is capable of discharging phosphor pastes emitting different colors. This is possible in accordance with certain preferred aspects of the invention, including apparatus such as that set forth in Claim 47, wherein the applicator has a plurality of phosphor paste storage sections, phosphor paste supply ports for supplying phosphor paste to the storage sections and passage for fluid communication between the storage section and the outlet holes. Of course, the phosphor paste storage sections can contain phosphor pastes capable of emitting different colors.

Claim 19 has been amended in accordance with the Examiner's helpful suggestion. Claim 20 has also been amended in accordance with the Examiner's helpful suggestion to recite that 50 wt% of the phosphor powder has a grain size of 0.5 - 10 μm ...".

With respect to Claims 35 and 44, Claim 35 has been amended so that it simply recites that the outlet holes of the paste applicator are non-circular in cross section. Claim 44 has been canceled. Finally, Claim 58 has been amended in accordance with the Examiner's helpful suggestion.

A number of other claims, specifically Claims 26, 27, 47 and 48, have been amended to correct minor grammatical errors or to place them in conformance with other similar claims. We accordingly respectfully submit that all of the Claims are now in proper form and are in compliance with 35 U.S.C. §112. Withdrawal of the rejection is respectfully requested.

The Applicants have also amended main Claims 1, 2, 33 and 58 so that they recite that the paste applicator has 640 to 2000 outlet holes. This amendment is fully supported

by both the original Specification of this Application and the English translation of the Applicants' earliest priority application, JP 8/336713, filed December 17, 1996. Support is specifically found in the original Specification of this Application by reference to page 38 at line 16, wherein the broad number of outlet holes of the paste applicator is stated to be between 1 and 6000. A sub-range within the broader range of 1 to 6000 can be determined by virtue of a further reference to the Specification on page 38 at line 21, for example, wherein that new upper range of 2000 is clearly set forth. Also, support may be found for the 2000 upper limit in originally-filed Claims 5 and 6. The lower limit of 640 outlet holes is clearly within the original 1 to 6000 range and is specifically supported in Example 4 of the originally-filed Specification on page 71 at line 10.

Referring now to the English translation of the JP '713 priority document, support may be found for the upper limit on page 23 at line 2, wherein it is stated that a paste applicator with 1 to 2000 outlet holes may be provided. Similarly, page 27 of the English translation of the JP '713 priority document at line 18 specifically recites a paste applicator having 640 outlet holes.

Thus, we respectfully submit that the lower and upper limits of the new claimed range of 640 to 2000 outlet holes is clearly supported, both in the broadest sense and in the specific sense, based on the original Specification and the English translation of the Japanese priority document. Use of a range of this type is also supported by case decisions. We invite the Examiner's attention to two leading decisions, namely *In re Wertheim*, 191 U.S.P.Q. 90 (CCPA 1976) and *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 227 U.S.P.Q. 177 (CAFC 1985). In the *Wertheim* case, the applicants sought the advantage of the filing date of a Swiss application describing a step of a process achieving a solid concentration of "25 to 60%" and gave specific examples of 36% and 50%. The

U.S. claims, which had been rejected, called for a smaller range of concentration "between 35% and 60%".

In construing the question whether the U.S. claim was entitled to the right of priority, the Court applied §112. The Court also considered whether persons skilled in the art would consider processes within the smaller range to be part of the appellant's invention and would be led by the disclosure to so conclude. Accordingly, notwithstanding the lack of literal support, the Court held that there was actual support, even though the corresponding disclosure did not disclose a 35% lower limit of the U.S. claims.

In *Ralston Purina*, a grandparent disclosure set forth a temperature range of 212° to 380°F. The later application claimed a range of 212° to 310°F. The Court of Appeals for the Federal Circuit applied the test as to whether the narrow range was sufficiently described in the later application to comprise a suggestion to those skilled in the art that such a range was embraced by the original invention. The Court applied the description requirement of 35 U.S.C. §112 in stating that the applicant's claimed range "involves [nothing] more than claiming a portion of that which has already been described." The Court proceeded to allow the narrower range despite the lack of literal support in the later specification.

We respectfully submit that both *Wertheim* and *Ralston Purina* are applicable. They support the Applicants' claimed range of 640 to 2000. We accordingly respectfully submit that the amendments to Claims 1, 2, 33 and 58 are fully supported and respectfully request that these amendments be entered into the Official File.

Turning now to the merits, we acknowledge the 35 U.S.C. §103 rejection of Claims 1 - 7, 9, 11, 16, 21 - 22, 26 and 30 - 31 over Shinoda. In view of the amendments to Claims 1 and 2, we respectfully submit that the rejection is now moot as it applies to Claims 1 - 4, 9, 11, 16, 21 - 22, 26 and 30 - 31. This leaves the rejection as it previously

applied to Claims 5 - 7. However, we respectfully submit that it would be nothing more than mere speculation, without support actually determined from the teachings and suggestions of Shinoda, that it would have been obvious to one of ordinary skill in the art to have determined the desired number of holes prior to coating based on the size of the panel to be coated. There is simply nothing in the disclosure of Shinoda that teaches or suggests to one of ordinary skill in the art to provide a paste applicator having 640 to 2000 outlet holes as recited in Claims 1 and 2. This is because Shinoda uses a completely different apparatus to achieve its goals. Use of hindsight is the only way to support this rejection.

In any event, it is clear from the disclosure of Shinoda that there is no teaching or suggestion for there to be a continuous discharge of phosphor paste onto a substrate having a plurality of barrier ribs from a paste applicator with 640 to 2000 outlet holes. This is demonstrated by reference to Fig. 22A of Shinoda, for example. In that regard, it can be seen that the square squeezer 82 of Fig. 22A travels in the direction M1 and at a particular period of time squeezes phosphor paste 28a through a first outlet hole/slot on the lefthand portion of that Figure. Then, subsequent to the passage of the square squeezer 82 beyond that screen opening 81 on the lefthand portion of Fig. 22A, there is a discontinuation of application of phosphor paste into the channel from the screen opening 81 on the lefthand side of the Figure.

At the same time, there is no application of pressure or force to the paste 28a and, accordingly, there is no application of paste to the screen opening 81 on the righthand side of Fig. 22A. Accordingly, Shinoda teaches a discontinuous procedure wherein phosphor paste is applied in an intermittent fashion as the square squeezer 82 passes across the surface of the screen 80 and intermittently applies phosphor paste to successive channels corresponding to screen openings 81. We accordingly respectfully submit that, even if one

of ordinary skill in the art were to accept, for the sake of argument, that it would be obvious to provide 640 to 2000 outlet holes in the apparatus of Shinoda (which is neither taught nor suggested) that the resulting methodology would still fail to teach or suggest the invention as it is recited in Claims 1 and 2, wherein the paste is continuously applied in a non-intermittent, continuous manner. As a consequence, we respectfully submit that the invention, as recited in Claims 1 and 2, would still not be taught or suggested by Shinoda irrespective of whether the screen of Shinoda contained 640 to 2000 outlet holes or any number of holes. This is because Shinoda explicitly teaches an intermittent, discontinuous process. Withdrawal of the 35 U.S.C. §103 rejection based on Shinoda taken alone is accordingly respectfully requested.

We acknowledge the rejection of Claims 28 and 29 over the hypothetical combination of Yamaura with Shinoda. However, Yamaura fails to provide teachings or suggestions that cure the fundamental deficiency of Shinoda as set forth above with respect to Claims 1 and 2. We accordingly respectfully submit that Claims 28 and 29 are clearly patentable over a hypothetical combination of Yamura with Shinoda.

We acknowledge the rejection of Claims 1 - 9, 11 - 17, 19, 21 - 22, 26 - 27 and 30 - 31 over the hypothetical combination of Shinoda with Nanto. We respectfully submit that independent Claims 1 and 2, as amended, are fully supported not only by the Applicants' Specification as originally filed, but are fully supported by the English translation of the Applicants' priority document JP 8/336713, filed December 17, 1996. We accordingly respectfully submit that Nanto, having a filing date of January 27, 1997, is not prior art against Claims 1 - 2. Support for some of the subject matter of Claims 1 - 2 has already been discussed. Reference to Fig. 1 of the Drawings also shows the substrate having a plurality of barrier ribs formed thereon and a paste applicator having outlet holes continuously applying a phosphor paste to the substrate for producing a plasma display.

The text of the JP '713 priority document also clearly sets forth the phosphor pastes of red, green and blue colors on, for example, page 5. In this case, the discharge is repeated three times, once each for the red, green and blue, or it can be simultaneously discharged. This is all set forth on page 5. Page 6, in the third full paragraph, also states that the paste is applied continuously. Finally, the phosphor paste is disclosed as being made from phosphor powder, beginning on page 7 of the English translation. We therefore respectfully submit that Claims 1 and 2 are fully supported by the Specification of this Application and the English translation of the Applicants' JP '713 priority document. We accordingly respectfully submit that any rejection based either primarily or secondarily on Nanto cannot stand. Inasmuch as Nanto is not prior art to those claims, the rejection based on hypothetically combining Shinoda with Nanto must fall. Withdrawal of the rejection is accordingly respectfully requested.

We acknowledge the rejection of Claims 33, 35, 37 - 41, 43 - 44, 48 - 49, 51, 53 - 56 and 58 based on the hypothetical combination of Ravi-Chandar with Nanto. Inasmuch as Nanto is not prior art to the claims for the reasons set forth above, we respectfully submit that the hypothetical combination of Ravi-Chandar cannot stand as well. Withdrawal of the rejection is accordingly respectfully requested.

There are further rejections of various claims based on additional combinations of either Shinoda, Ravi-Chandar, Mettenbrink, Osaka, Igarashi, Mizuno and/or Silverbrook with Nanto. We respectfully submit that those rejections also must fall in view of the removal of Nanto as prior art. Withdrawal of those rejections is also respectfully requested.

We have added new Claims 59 and 60. Claim 59 states that the paste applicator is spaced above the barrier ribs and moves relative to the barrier ribs to form the phosphor layer. Support is clearly found in the Drawings of both this Application and the JP '713

priority document. Claim 60 contains the subject matter deleted from Claim 1. Entry into the Official File is respectfully requested.

In light of the foregoing, we respectfully submit that the entire Application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,



T. Daniel Christenbury
Reg. No. 31,750
Attorney for Applicant

TDC:lh
(215) 563-1810

In the Specification (Clean Copy)

Please replace the paragraph spanning pages 38 and 39 with the following:

The number of outlet holes can be 1 to 6000, but a desirable range is 20 to 2000.

1
2
If the number of outlet holes is too small, it takes too much time for coating. If the number is 150 or more desirably, a phosphor layer suitable for a highly precise plasma display can be formed in a short time. If the number of holes exceeds 2000, it is difficult to secure the accuracy of the outlet holes, and to provide a highly precise plasma display. If the number of outlet holes is kept in a range of $16n \pm 5$ (n is a natural number), a phosphor layer suitable for a plasma display capable of being driven on a general purpose circuit can be easily formed.

On page 74, please replace the first full paragraph with the following:

2
A phosphor layer was formed as described in Example 1, except that a glass substrate with 2000 barrier ribs with a height of $120 \mu\text{m}$ and a width of $30 \mu\text{m}$ formed at a pitch of $150 \mu\text{m}$ was used, that a paste applicator with 640 outlet holes with a diameter of $80 \mu\text{m}$ formed at a pitch of $450 \mu\text{m}$ was used, and that the discharge of the red phosphor paste was followed by drying at 80°C for 60 minutes with the coating face down, discharging the green phosphor paste, drying at 80°C for 60 minutes with the coating face down, discharging the blue phosphor paste, drying at 80°C for 60 minutes with the coating face down, and burning at 500°C for 30 minutes. The evaluation results are shown in Table 1.

In the Claims (Clean Copy)

Sub E3
1. (Thrice Amended) A method for producing a plasma display, comprising the step of continuously applying a phosphor paste containing a phosphor powder and an organic compound onto a substrate having a plurality of barrier ribs formed thereon, from a paste applicator with 640 to 2000 outlet holes for one or red, green or blue phosphor paste to form a phosphor layer.

Sub E1
2. (Four Times Amended) A method for producing a plasma display, comprising the steps of coating a substrate having a plurality of adjacent barrier ribs, with three phosphor pastes respectively containing a phosphor powder emitting light of red, green or blue, as stripes in spaces between said respectively adjacent barrier ribs, from a paste applicator having 640 to 2000 outlet holes for one of red, green or blue phosphor paste, and heating to form a phosphor layer.

E4
7. (Thrice Amended) A method for producing a plasma display, according to claim 1 or 2, wherein said paste applicator has a total of $16n \pm 5$ outlet holes, wherein n is a natural number.

Sub E2
12. (Thrice Amended) A method for producing a plasma display, according to claim 1 or 2, wherein said barrier ribs have top surfaces, said phosphor pastes are applied while the distance between said top surfaces of the barrier ribs are formed on a glass substrate and the tip of each said outlet holes of the paste applicator is kept at 0.01 to 2 mm from said top surfaces.

13. (Thrice Amended) A method for producing a plasma display, according to claim 1 or 2, wherein one paste applicator is capable of discharging phosphor pastes emitting different colors, and wherein the shortest distance between the outlet holes that are connected for applying said phosphor pastes that are mutually different in color, is 600 μm or more.

19. (Thrice Amended) A method for producing a plasma display, according to Claim 1 or 2, wherein said paste applicator and said substrate undergo movement relative to each other in parallel to the barrier ribs on the substrate, the application of phosphor pastes is started, and before the relative movement is stopped, said jet application is stopped.

20. (Four Times Amended) A method for producing a plasma display, according to Claim 1 or 2, wherein 50 wt% of said phosphor powder has a grain size of 0.5 to 10 μm , and wherein the specific surface area of each of said phosphor powders is 0.1 to 2 m^2/g .

26. (Amended) A method for producing a plasma display, according to claim 1 or 2, wherein each of the phosphor pastes satisfy the following relation:

$$(2H + P - W) \times 5 \leq H \times (P - W) \times a/100 \leq (2H + P - W) \times 30$$

where H is the height of each barrier ribs (μm); P is the pitch of the barrier ribs (μm); W is the width of each barrier rib (μm); and a is the phosphor powder content of the phosphor paste (vol%).

27. (Amended) A method for producing a plasma display, according to claim 1 or 2, wherein the phosphor pastes have a viscosity of 2 to 50 Pa.s.

33. (Four Times Amended) An apparatus for producing a plasma display, comprising a table for fixing a substrate with a plurality of barrier ribs formed on the substrate surface, a paste applicator having 640 to 2000 outlet holes to face the barrier ribs of the substrate, wherein a phosphor paste supply is operatively connected to the paste applicator, and a moving actuator for three-dimensionally moving the table and said paste applicator relative to each other.

35. (Thrice Amended) An apparatus according to claim 33, wherein the outlet holes of the paste applicator are non-circular in cross section.

E10
48. (Amended) An apparatus for producing a plasma display, according to claim 33, wherein two or more paste applicators are present.

E11
Sub E3
58. (Four Times Amended) An apparatus for producing a plasma display, comprising three coating devices provided in series to deliver three phosphor pastes, said coating devices each being equipped with a table for fixing a substrate having barrier ribs, a paste applicator with 640 to 2000 outlet holes arranged to face the barrier ribs of the substrate, a supply means for supplying phosphor pastes to the paste applicator, and wherein a moving means for three-dimensionally moving the table and the paste applicator relative to each other, is provided.

E12
59. (New) The method of Claims 1 or 2, wherein the paste applicator is spaced above the barrier ribs and moves relative to the barrier ribs to form the phosphor layer.

60. (New) The method of Claim 1, wherein the phosphor layer has a lateral side wall thickness (T1) at a position corresponding to a half of the height of each barrier rib and having a bottom wall thickness (T2), wherein the thicknesses (T1) and (T2) satisfy the following relationship:

$$10 \leq T1 \leq 50 \mu\text{m}$$

$$10 \leq T2 \leq 50 \mu\text{m}$$

$$0.2 \leq T1/T2 \leq 5.$$